Solid Earth Discussions

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Comment on se-2021-124

Max Moorkamp (Referee)

Referee comment on "Utilisation of probabilistic magnetotelluric modelling to constrain magnetic data inversion: proof-of-concept and field application" by Jérémie Giraud et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-124-RC1, 2021

The authors present a workflow for constrained inversion of magnetic data and show examples with constraints derived from magnetotelluric inversions. The method builds on previous publications from the same authors along the same line of enquiry, but is sufficiently interesting and novel to warrant publication. Overall, I think the shown examples demonstrate the properties of the approach well, both advantages and disadvantages, and the final discussion is balanced. The authors address some of the issues encountered in the examples, make suggestions how to deal with them and what could be done in the future. I have two major issues though that need to be addressed before publication:

- The description of the method and also the setup for the experiments for the most part reads like a rough summary. Important parameter values are not given, complex concepts are introduced through a single equation without much explanation and generally little effort is made to explain why certain choices have been made. As a long term joint inversion expert I can guess some things, but even for me many questions remain. I expect that the general reader will have significant difficulties to follow large parts of the description. In the pdf supplement I give detailed suggestions where the discussion/description needs to be expaned.

- The synthetic magnetic data in Figure 3 look strange to me, given that magetic measurements are only sensitive to susceptibiltiy contrasts. Either the authors have made some adjustments to the data (which should be described in the manuscript) or there could be some strong influence from the finite extent of the modelling domain. The authors should therefore carefull check their implementation and model setup.

I also provide a variety of comments in the pdf supplement which hoepfully will help to improve the manuscript. Taken together I think a major revision is required.

Sincerely

Max Moorkamp

Please also note the supplement to this comment:
https://se.copernicus.org/preprints/se-2021-124/se-2021-124-RC1-supplement.pdf